WATER QUALITY AND QUANTITY SURVEY

TOWN OF VALLEY EAST

SUNNYSIDE SUBDIVISION

1981

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MINISTRY OF THE
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WATER QUALITY AND QUANTITY SURVEY

TOWN OF

VALLEY EAST

SUNNYSIDE SUBDIVISION

1981

Prepared by:

Ministry of the Environment
Northeastern Region
Sudbury, Ontario

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TABLE OF CONTENTS

Page

Summary 1

Introduction 4

Topography and Drainage 5
Survey Procedures 5

Questionnaire Findings 7

Sewage Disposal 7
Water Supplies 8

Survey Sample Analysis Results 10

Bacteriological Quality 10
Chemical Quality 10

Discussion 11

Sewage Disposal 12
Water Supply 13

Conclusions 20

Recommendations 22

Appendices 25

SUMMARY

At the request of the Valley East Town Council and the Regional Municipality of Sudbury/Ministry of the Environment Liaison Committee, a survey of the water and sewage systems in the Sunnyside Subdivision was conducted in July of 1980.

Of the 113 residences in the study area, 99 were surveyed. In keeping with standard practice of the Ministry's Sudbury District Office, all residents surveyed were provided with the physical/chemical and bacteriological results of analysis done on their drinking water.

Listed below is a summary of the findings as divided into health considerations and aesthetic considerations.

Health Considerations:

1) Malfunctioning sewage systems - 4 problems were reported. All are correctable on an individual basis.

2) The water quality of drinking water supplies at the time of the survey was satisfactory. Only 6 supplies were found to have water with excessive levels of bacteriological activity. These sources were not interrelated and can all be corrected on an individual basis.

3) Elevated nitrate concentrations were also found in water of 7 wells. High nitrate concentrations in water are often indicative of long-term accumulated pollution influences. Excessive nitrates are believed to be non-toxic to adults but may cause a condition known as methemoglobinemia in infants of 3 months or less.

Aesthetic Considerations:

Forty-five (45%) of the wells had excessive iron levels, fifty (50%) supplies had elevated manganese concentrations, and sixty-five (65%) sources had highly coloured water. Seventy (70%) wells had turbidity levels above the objective criteria.

In conclusion, this report discusses a survey conducted in July of 1980 and the situation found at that time. This survey indicated that the individual water supply and sewage disposal systems do not appear to pose an area health problem. Water quality in the subdivision was found to be generally acceptable. Aesthetic problems were widespread but are not considered to be a concern from a health viewpoint.

While area problems did not appear evident in this survey, a greater number of problems might be found during periods of greater precipitation and higher groundwater levels, such as following spring thaw. If evidence of a greater number of problems is determined, re-examination of whether they constitute a significant "area" condition should be done.

Based on the small number, and types, of health/environmental problems identified by the July '80 survey, it would appear that the Sunnyside Subdivision area does not have a situation eligible for assistance under the Ministry of the Environment's Low-Cost Alternative (Private Service Funding) grant program. It is recommended that the problems identified be corrected by the individual property owners involved.

INTRODUCTION

A sanitary survey of the Sunnyside Subdivision area was undertaken in July 1980 by the Sudbury District Abatement Section of the Ministry of the Environment. The survey was performed in response to a request by the Council of the Town of Valley East to the Ministry through the Regional Municipality of Sudbury. Its purpose was to more fully assess the water supply and sewage disposal systems and to establish whether there were problems in the subdivision which were eligible for assistance under the Minsitry's Low-Cost Alternative (or Private Service Funding) grant program.

The Sunnyside Subdivision area is situated 16 km northeast of the City of Sudbury in the Town of Valley East. It consists of 113 residences with a population of approximately 455. The development of this 150 lot subdivision area began about 1970. The area is approximately 3 km distant from other developed lands, being Val Caron, and the homes are serviced by individual water supply and sewage disposal systems.

The study area is comprised of five main streets; Elm, Durham, Cedar, Larch and Maple. A plan of the area is shown in Appendix A.

Topography and Drainage

The topography of the area is predominantly flat with low local relief. Very fine sandy silts comprise the geologic material of the terrain. The study area lies in a fluctuating high water table. Surface drainage flows to the Whitson River which is fed from Whitson Lake, located south of the subdivision. A portion of the northern end of the study area is within the flood plain of the Whitson River, as established by the Nickel District Conservation Authority.

Survey Procedures

The field work of the water supply and sewage disposal system survey was carried out in July 1980. This work was performed with the aid of additional manpower from the Regional Municipality of Sudbury and the Town of Valley East.

The survey field work consisted of the following procedures:

1) A plan of the area was developed to catalogue every residence.

2) At each home, a questionnaire form (see Appendix B) was completed with the aid of the owner or tenant.

3) At the same time, samples of the drinking water were collected at each residence for bacteriological and physical/chemical analyses. Bacteriological samples were forwarded to the Sudbury Ministry of Health Laboratory for coliform examination. Chemical samples were sent to the Ministry of the Environment laboratory in Toronto. The physical/chemical parameters that were investigated included: sodium, iron, chlorides, manganese, hardness, alkalinity, colour, turbidity, pH, conductivity, nitrogen as organic nitrogen, nitrogen as nitrate, dissolved organic carbon, potassium, calcium, magnesium, sulphate, arsenic, and the metals, copper, lead, cadmium and zinc.

4) Each lot was sketched to show the locations of wells/points, etc. and sewage disposal systems.

5) Each property was inspected for evidence of malfunctioning sewage systems.

Of the 113 residences in the study area, a total of 99, or 88% of the total, were surveyed by the field team. Occupants could not be contacted in the other 14 residences for inclusion in the survey. A list of the home addresses, and the occupants/owners included in the survey is provided in Appendix C.

QUESTIONNAIRE FINDINGS

Sewage Disposal

Appendix D summarizes the types and ages of sewage disposal systems as was reported by the owners and tenants. All of the homes utilize septic tank/tile bed sewage disposal systems. Thirteen percent of the sewage systems were reported to be less than 5 years old, 45% to be between 6 and 10 years of age, 35% to be greater than 10 years old. The age of 5% of the systems was reported to be unknown.

At the time of the survey, a total of 17 (17%) sewage system problems were identified. Four systems were reported by the residents to be malfunctioning. The particulars of these problems are listed below:

a) One sewage system was operating on half capacity (half the tile bed had been damaged by vehicular traffic).

b) One septic tank was believed to have sunk (settled) and to have no bottom. In addition, the owner stated that an area over the tile bed is usually moist. The moist area was not visible at the time of inspection.

c) One system was reported to be causing ponding of sewage in a neighboring lot during the spring.

d) One tile bed of a septic system was reported as having overflows and breakouts of sewage during the spring.

In addition, 8 (8%) cases of grey water discharge to ditches/ground surface were identified. Another five (5%) of the homes have leaching pits for grey water discharges. Regulations require that grey water be discharged to an acceptable sewage disposal system and not to ditches/ground surface or leaching pits.

Water Supplies

The types and ages of water supply systems utilized are summarized in Appendix E. Appendix F presents the complaints voiced by residents with regard to their water supplies.

Ninety-three (93%) residences were found to utilize sand points, for water supply at an average depth of 20.5 feet. Seven percent of the homes have drilled wells of an average depth of 90 feet. Only one home was found to use a dug well system. The source of supply of one other home was unknown.

The majority of supplies (40%) were reported to be less than 5 years old, thirty-one percent to be between the ages of 6 and 10 and 21% to be greater than 10 years. The age of one supply was reported to be unknown.

The most common complaints, as reported by the residents, were hardness (by 56%) and iron (50%). Taste and odour were noted as a concern by 29% and 23% respectively.

Of the 99 residences surveyed, 10% of those interviewed rated their water quality as excellent, 5% as very good, 36% as good, 20% as fair, 17% as poor and 11% made no comment. Thus, only 17% of those interviewed appeared to be dissatisfied with the quality of their water. Water shortages were reported as a problem with 17% of the homeowners.

Few residents (14%) reported that they employed water treatment devices of any description. Of those who did, nine use a filter, 2 use a softener, and 3 residents boil their water before consumption (refer to Appendix F).

SURVEY SAMPLE ANALYSIS RESULTS

Bacteriological Quality

Bacteriological analysis of the drinking water supply samples indicated that 6 (6%) supplies had coliform counts exceeding the Ministry criteria (see Appendix E).

The samples of three of those water systems had both total and faecal coliform counts, while the other three had total coliforms present only.

The residents concerned were contacted immediately regarding the adverse bacteriological results and provided with instructions for disinfection of their water supply. The Sudbury and District Health Unit was informed also.

Physical/Chemical Quality

Appendix G summarizes the physical/chemical quality of the water supplies of the study area.

The results of the physical/chemical analysis of water supply samples indicates that 42 (42%) of the supplies have concentrations of sodium above the notification level of 20 mg/L. Seven (7%) had nitrate concentrations above the Ministry's Drinking Water Criteria of 10 mg/L. Iron and manganese guidelines were exceed in 45(45%) and 50 (50%) of the wells respectively.

Turbidity exceeded the criteria in 70 (70%) of the cases. Colour exceeded the recommended level of 5 Hazen Units in 65 (65%) of the water supplies. Forty-eight (48%) supplies were found to be outside the pH criteria.

Organic nitrogen concentrations were found to be above the limit of 0.15 mg/L in 7(7%) water systems. Five (5%) supplies had dissolved organic carbon levels above the criteria of 5 mg/L.

All samples (17 in total) collected for arsenic analysis were found to have concentrations well below the Ministry's objective limit of 0.01 mg/L.

In addition, laboratory results indicated that all samples (total of 9) analysed for metals (ie. copper, lead, cadmium, and zinc) concentrations were well within the criteria for each metal listed. Appendix A-1 illustrates the sampling locations for arsenic and metal parameters.

DISCUSSION

The sanitary survey conducted in July 1980 indicated that few problems were discovered in the Sunnyside Subdivision. A total of 17 health consideration problems were found, namely, malfunctioning sewage systems, bacteriological counts and elevated nitrate levels in water supplies.

Sewage Disposal

In general, subsurface sewage disposal systems appear to be operating satisfactorily. Only 4 malfunctioning systems were reported.

One system was reported to be operating on half capacity since vehicular traffic had damaged half the tile bed. Another resident believed his septic tank had settled or sunk and that it had no bottom. He reported that an area over his tile bed is usually moist, however, the moist area was not visible at the time of his inspection. Another property owner reported ponding on his lot of sewage from a neighbouring sewage system during the spring. A fourth resident stated that his tile bed overflows during the spring thaw. All 4 problems occurred in the southern portion of the subdivision and all of these sewage systems were 10 years of age or greater.

Eight cases of illegal grey water (sink and laundry waste) discharges to the ground surface and ditches via the sump pump were also determined. In addition, five (5%) residents employ leaching pits for grey water disposal. Although no health hazards apparently were being caused by these systems, regulations require that acceptable sewage systems be used to dispose of this grey water sewage. Hence, all household waste water should be directed to the septic tank/tile bed system.

All of the above-mentioned problems were referred to the Sudbury and District Health Unit.

Water Supply

With respect to bacteriological quality, 6(6%) of the water supplies were found to have elevated counts which exceeded the drinking water criteria. Five of these supplies were sand points and one was a drilled well.

The average of known depths of the 5 sand points is 27 feet. This would imply that contamination may be present within this relatively thin subsurface depth. In addition, all 5 of these sand points were located within 45 feet of the septic tanks servicing the homes. The source of contamination in those cases is assumed to be the sewage systems. Relocation of the points away from all sewage systems, and installation at a deeper depth, may correct these problems. If water of acceptable quality cannot be obtained by installation of sand points at deeper depths, then drilled wells to much deeper depths or water disinfection equipment (ie. chlorinator or ultraviolet light devices) should be considered.

The contamination for the existing drilled well may be due to an improperly installed well casing and/or seal, which permits contaminated subsurface or surface water, or foreign material, to enter the well. Proper sealing of the casing or installation of a new well to a deeper depth may be necessary. Use of water disinfection equipment (ie. chlorinator or ultraviolet light devices) should also be considered as a corrective measure.

Residents whose water supplies were found to contain coliform counts above the Ministry criteria were immediately advised. Instructions were provided on how to disinfect their water, either by boiling or by chlorination, prior to consumption.

Turning to the results of physical/chemical quality analyses, nitrate levels were found to exceed the Ministry criteria of 10 mg/L in 7(7%) water supplies. This maximum concentration is based on evidence that nitrate content in the drinking water exceeding this level has been associated with an oxygen-starved condition in infants 3 months and less known as methemoglobinemia. Older children and adults have a much greater tolerance for higher levels without encountering nitrate toxicity. Property owners with supplies found to have nitrates exceeding the Ministry criteria of 10 mg/L were advised. In addition, the Sudbury and District Health Unit was notified of the water supplies with this problem.

The 7 water supplies found to have elevated nitrate levels were sand points with an average depth of 19 feet. The majority (5) of the cases were situated in the south end of the subdivision. Here nitrate levels exceeded the criteria in two instances in neighbouring lots (#95, 97, 16 and 18). Two cases of excessive nitrates were found in the northern section of the subdivision.

Nitrate is an essential nutrient for vegetation and thus a component of soil and biological material. Elevated nitrate levels in water supplies is usually associated with agricultural fertilizing and animal waste practices, and from wastewater disposal, such as from septic tank/tile field systems.

The incidents of high nitrates in the Sunnyside Subdivision area may be attributed to such factors as:

a) The age of the septic systems. The majority (57%) were 10 years of age or greater.

b) The proximity of septic system to the water supply. In all 7 cases, the distance of the septic system was within 40 feet of the sand point.

c) The relatively shallow depth at which the sand points were installed.

The suitability of the soil type for absorbing liquid waste from septic tank/tile beds is particularly good in the area, since the Sunnyside Subdivision is underlain by sandy soil. The percolative capacity of the soil for handling septic tank effluent is substantial. However, with time, the first twenty feet or so of soil mantle below the field beds eventually becomes saturated with an accumulation of nitrates, the result of the breakdown of the sewage effluent.

With very granular soil of high percolation capacity, such as in the Sunnyside area, the nitrate accumulation becomes spread over a larger area and can affect shallow subsurface water supplies. This type of problem is particularly prevalent in more built-up areas where homes are side-by-side and/or back-to-back, and all on private services.

Nitrate removal can be accomplished using a reverse osmosis or ion exchange unit. This water treatment equipment, however, is relatively expensive (up to $1,500) with ongoing maintenance requirements and costs.

A more practical alternative might be to increase the depth from which water is drawn by installing deeper points in locations that are an adequate distance from septic tank/tile bed systems.

Sodium concentrations were found to be elevated above the Ministry's notification guidelines in 42 (42%) of the water supplies. Thirty-six sand points, 4 drilled wells, one dug well, and one unknown source of supply, contained elevated sodium concentrations. The water supplies having high sodium content were randomly distributed throughout the subdivision.

There is no maximum recommended limit in the Ministry of the Environment's "Drinking Water Objectives" for sodium. However, high sodium concentrations can have an adverse affect on people with cardiac, renal and circulatory problems. Therefore the Medical Officer of Health is notified of all supplies haveing sodium concentrations of 20 mg/L or more.

In addition, the residents concerned were notified of the water analysis results. They were further advised to consult their family doctor if they wished information regarding the health implications of consuming their water with sodium concentrations greater than 20 mg/L.

Forty-five (45%) and 50 (50%) of the wells contained iron and manganese levels above the maximum recommended limit of 0.03 and 0.05 mg/L respectively. Concentrations of iron and manganese exceeding these levels are not a health hazard, but are a concern for aesthetic reasons. Excessive levels of iron and manganese can impart a brownish colour stain to fixtures and laundry. They can also produce an objectionable taste in the water and beverages made from the water. Several methods are available which either remove or control these metals.

Turbidity and colour are also aesthetically displeasing but are not considered a health problem. Seventy-one (71%) supplies had excessive turbidity levels and 65 (65%) supplies had elevated colour. Both turbidity and color are due to a fine suspension of clay, silt or organic matter. Treatment can be accomplished using filters to remove the fine particles.

Aesthetic parameters are not considered to be a health concern when levels exceed Ministry guidelines. These levels are set as the maximum tolerable before an aesthetic problem may be perceived. Simple exceedence of guideline levels of these aesthetic parameters is not recognized as having a health impact, as stated in the "Guidelines for Canadian Drinking Water Quality, 1978, Supporting Documentation", published by Health and Welfare Canada.

All of the above water quality problems and the implications of water quality analysis parameters were discussed at two public meetings requested by the Town of Valley East representatives and the residents. These meetings were held September 30, 1980 and June 9, 1981 in Confederation High School and were each attended by representatives of the Ministry of the Environment, the Sudbury and District Health Unit, the Regional Municipality of Sudbury, Town Council and approximately 40 residents.

Further to the survey, water shortages were reported by 17 (17%) of the homeowners. Sand points were utilized by 15 of these residents. The average depth of these sand points was reported as 21 feet and again indicates problems being encountered at the relatively shallower depths.

One drilled well with a reported depth of 37 feet and a dug well having a depth of 7 feet also apparently experienced water shortage problems.

The majority of the property owners in the Sunnyside Subdivision reported that they were supplied with copious quantities of water. Hence, this would indicate that the aquifer in the area is generally capable of providing ample water. It would appear that deepening problem wells and properly maintaining problem well points (ie. points tend to become corroded and/or blocked over a period of time and require flushing or replacement) should solve most water supply problems. If deepening well points does not produce acceptable water, development of drilled wells into bedrock should be considered. Records of existing drilled wells in the area demonstrate that acceptable water is available.

CONCLUSIONS

Of the 99 residences surveyed, only a small number of water and sewage related health/environmental problems were found.

Four malfunctioning sewage disposal systems were reported. All are correctable on an individual basis.

Six water supplies were found to be bacteriologically contaminated. Contamination of the sand points is believed to be due to the proximity of the septic system to the water supply and the shallow depth at which they are installed. The cause of contamination for the drilled well is not clearly evident, however, an improper seal may be allowing surface water or shallow subsurface water to gain access into the well, thus causing contamination. Water from all six sources should be disinfected (ie. boiled or chlorinated) before consumption.

In addition, 7 water supplies with elevated nitrate levels were encountered. Nitrates from drinking water is not toxic to adults and older children unless extremely high but nitrate levels averaging 10 mg/L or greater may cause a condition in infants known as methemoglobinemia. These water supplies should be treated for nitrates removal or the well point relocated at least 50 feet from all sewage systems and installed at greater depth. It may be necessary to consider installing a drilled well down to a much deeper aquifer if deepening of the well point provides poor quality or quanity of water.

In a number of wells (46%), water with excessive sodium concentrations were found. Since elevated sodium levels can have an adverse effect on people with cardiac, renal and circulatory problems, the Medical Officer of Health was notified and residents advised to consult their physicians if concerned that sodium concentrations are greater than 20 mg/L.

Aesthetic problems such as excessive iron, manganese, turbidity and colour content were widespread but do not pose a health hazard to users.

The majority of homes are supplied with ample quantities of water. Water shortages were encountered by supplies drawing from relatively shallow depths (average of reported well depths was 20.5 feet). These problems would appear to be correctable by deepening the wells and ensuring that the well points are properly maintained.

RECOMMENDATIONS

The primary intent of the Ministry of the Environment's Low-Cost Alternative grant program is to assist in the correction of area problems that pose a health or environmental hazard to significant portions of a community.

By the assessment of the water quality and sewage disposal systems, it was found that a small percentage of health consideration problems (malfunctioning sewage systems, bacteriological counts and excessive nitrate levels in water supplies) were evident. Chemical parameters such as iron, manganese, colour and turbidity in excess concentration impose aesthetic problems. These aesthetic problems were widespread in the Sunnyside Subdivision area but are not considered to be a concern from a health point of view. Environmental problems of water shortages were also found in a few cases, but this was not a general problem and appeared to be correctable by deepening the water supply sources involved.

Therefore it would appear that there is not an area health/environmental problem for which eligibility for assistance under the Ministry's Low-Cost Alternative (or Private Service Funding) grant program would apply. Therefore, as a result of the survey, the following recommendations are provided:

a) The majority of existing homes in this area can be adequately serviced by the individual water and sewage systems presently in use.

b) The four defective sewage disposal systems encountered should be repaired. The Sudbury and District Health Unit has been notified for follow-up corrective action.

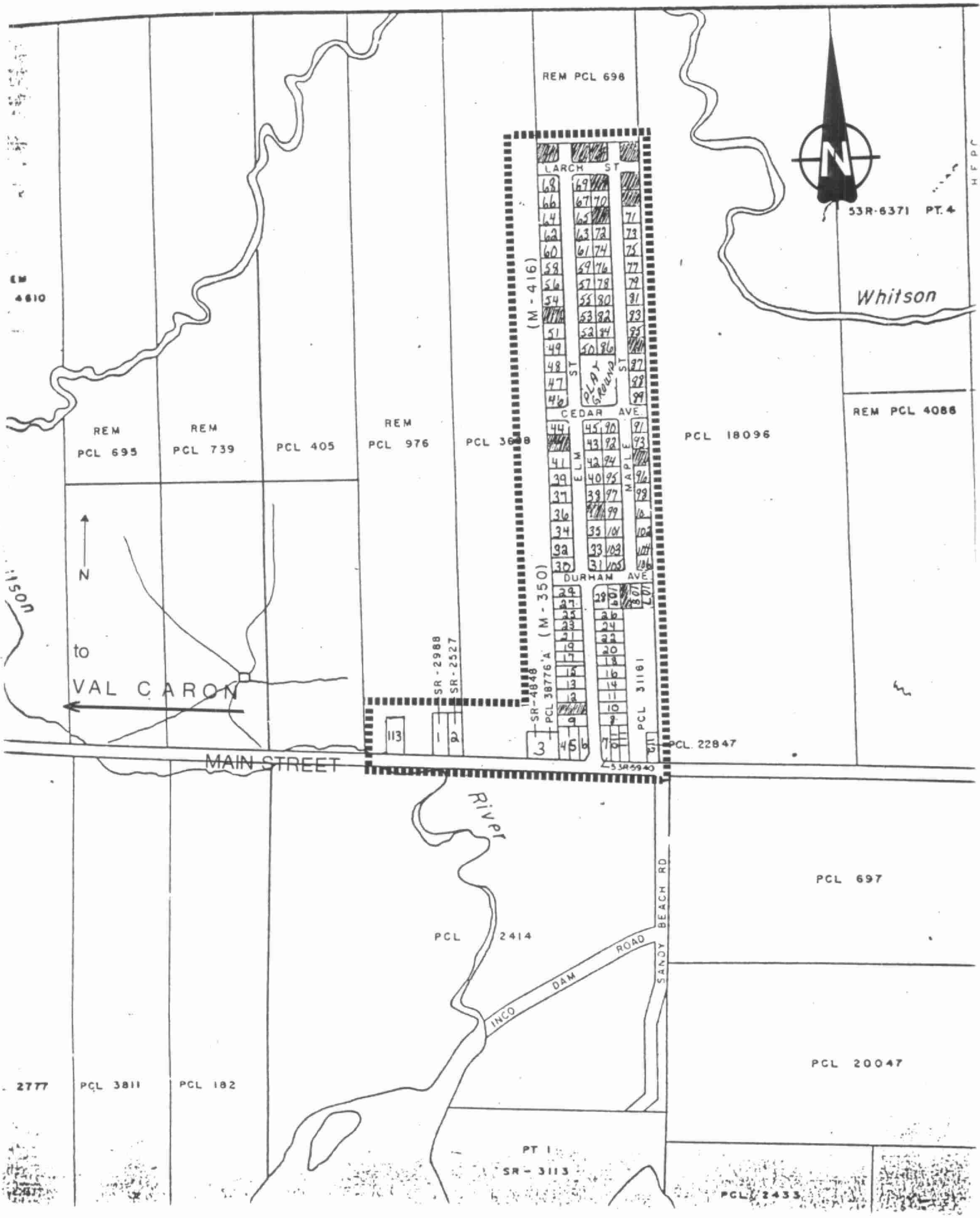
c) The owners of the six water supply systems found to contain the presence of coliform bacteria were advised to disinfect or boil their water prior to its consumption (consideration should be given to installing new supplies located at least 50 feet from all adjacent sewage systems and possibly installed to a depth of greater than 30 feet).

d) Water sources that were found to contain elevated nitrate concentrations should not be used for infant feeding unless it is treated for nitrate removal. The most immediate solution would be to import water for formula preparation. However, as a long-term solution, installation of a nitrate removal water treatment system or development of a new water supply at a greater distance of at least 50 feet from all adjacent sewage systems, and possibly installed to a depth greater than 30 feet, is recommended to ensure that contamination from sewage systems is not occurring.

e) Aesthetic problems may be eliminated if desired, by the individual owners through installation of filtering devices. Regular maintenance and filter cartridge replacement is necessary to ensure proper operation of these devices.

f) Wells with water shortages should be deepened and well points should be back-flushed or replaced to solve quantity problems.

APPENDIX A
SURVEY AREA
WATER QUALITY SURVEY
SUNNYSIDE SUBDIVISION
TOWN OF VALLEY EAST
JULY, 1980

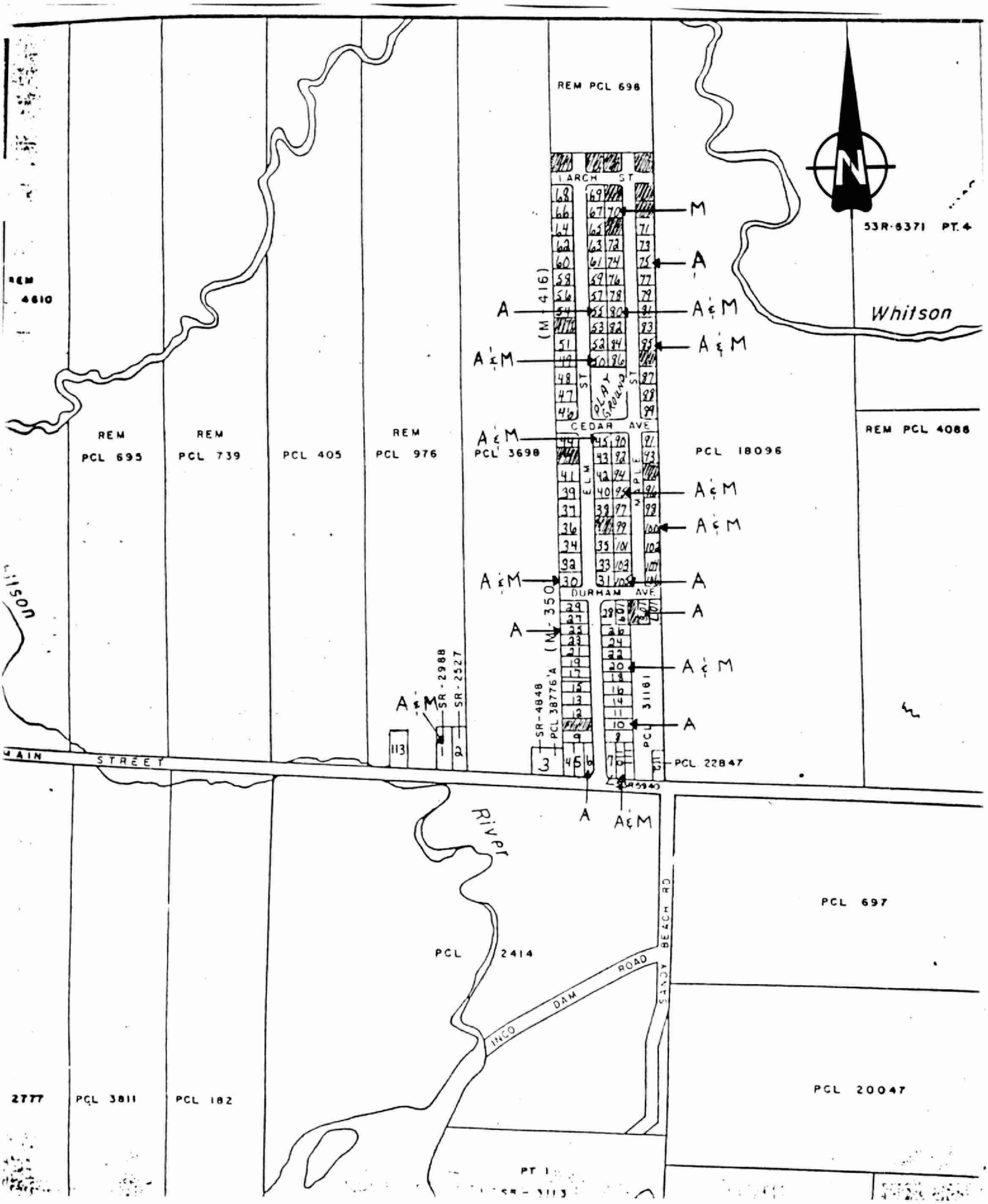


APPENDIX A-1

ARSENIC AND METAL SAMPLING LOCATIONS
SUNNYSIDE SUBDIVISION

A = Arsenic

M = Metals



APPENDIX B
SURVEY QUESTIONNAIRE

Survey No.: ____________
Survey: ____________ Owner's Last Name.: ____________

Residence Location: ____________
Information Received from: ____________

PROPERTY INFORMATION

Name of Owner: ____________ Telephone No.: ____________
Mailing Address: ____________

Name of Resident: ____________ Telephone No.: ____________
Mailing Address: ____________

Size of Lot: ____________ No. of Residents: ____________
Topography: ____________ No. of Bedrooms: ____________
Soil Type: ____________ Laundry Facilities: ____________
Other Water Consuming Devices: ____________

SEWAGE DISPOSAL SYSTEM

Type: ____________ Age: ____________ Tank Material: ____________
Distance to: Surface Water ____________ Water Supply ____________
Greywater Discharge ____________ Ponding Sewage ____________
Pump-outs ____________ Previous Problems ____________

WATER SUPPLY

Type: ____________ Depth: ____________ Age: ____________
Ever Disinfected: ____________ Chlorinator: ____________
Filtration (type): ____________ Ever Changed: ____________
Pump Type: Submersible ☐ Piston ☐ Jet ☐
Previous water sample taken: ☐ When: ____________ Results: ____________
Any history of recurring health problems from drinking the water ____________
____________ Examined by Doctor ____________

CONSUMER COMPLAINTS

Taste ____________ Odour ____________ Hardness ____________
Colour ____________ Iron ____________ Quantity ____________
Quality ____________ Other ____________

COMMENTS: ____________
____
____

Surveyed by: ____________

DIAGRAM ON REVERSE SIDE SHOWING LOCATION AND DISTANCES.

APPENDIX C

RESIDENCES SURVEYED

Survey Reference No.	Address	Occupant/Owner
1	940 Main Street	Mr. Joseph Merkas
2	Main Street	Mr. Walter Finn
3	900 Main Street	Elizabeth McGregor
4	870 Main Street	Kathleen Pozdyk
5	848 Main Street	Mr. Eddy Loyer
6	3001 Elm Street	Mr. Michael Lavigne
7	824 Main Street	Mr. D. Pelletier
8	3026 Elm Street	Mr. T. Toth
9	3033 Elm Street	Mr. Peter Haus
10	3034 Elm Street	Mr. M. Yurich
11	3042 Elm Street	Mr. Rowald Desormeaux
12	3047 Elm Street	Mr. Aurele Mallette
13	3059 Elm Street	Mr. R. Gilchrist
14	3056 Elm Street	Mr. Roger Desbois
15	3065 Elm Street	Mr. Charles Hutchinson
16	3064 Elm Street	Mr. R. Mongeau
17	3077 Elm Street	Mr. Rolly Lafantaisie
18	3070 Elm Street	Mr. P. Gagnon
19	3083 Elm Street	Mr. Leurent Loyer
20	3078 Elm Street	Mr. Steve Duvall
21	3091 Elm Street	Mr. S. Dobranski
22	3086 Elm Street	Mr. David Kelly
23	3099 Elm Street	Mr. Bob Daggett
24	3094 Elm Street	Mr. T. Vanclief
25	3107 Elm Street	Mr. Walter Turner

APPENDIX C (continued)

Survey	Address	Occupant/Owner
26	3100 Elm Street	Mr. A Doherty
27	3111 Elm Street	Mr. Robert Bainbridge
28	3110 Elm Street	Mr. A. Rawlyk
29	3135 Elm Street	Mr. R. LaRiviere
30	3139 Elm Street	Mr. S. Martel
31	3140 Elm Street	Mr. B. Murphy
32	3141 Elm Street	Mr. R. J. LaRose
33	3152 Elm Street	Mr. J. Demerse
34	3161 Elm Street	Mr. V. McTaggart
36	3175 Elm Street	Mr. M. St. Amand
37	3185 Elm Street	Mr. Allan Liimatainen
42	3206 Elm Street	Mr. E. Marinier
43	3218 Elm Street	Mr. M. Vaillancourt
44	3233 Elm Street	Mrs. Paulette Prevost
45	3232 Elm Street	Mr. D. Hand
48	3273 Elm Street	Mr. G. Trottier
50	3280 Elm Street	Mr. R. Prevost
51	3285 Elm Street	Mr. J. Beynen
52	3296 Elm Street	Mr. William Sheppard
53	3308 Elm Street	Mr. E. McDonald
54	3309 Elm Street	Mr. Hubert Blais
55	3320 Elm Street	Mr. L. Labbee
56	3315 Elm Street	Mr. R. Benoit
57	3332 Elm Street	Mr. R. Leblanc
58	3343 Elm Street	Mr. R. Roy

APPENDIX C (continued)

Survey	Address	Occupant/Owner
61	3354 Elm Street	Mr. Roma Roy
63	3362 Elm Street	Mr. F. St. George
64	3371 Elm Street	Mr. M. Godin
65	3370 Elm Street	Mr. J. Haws
66	3387 Elm Street	Mr. G. Bellemare
67	3386 Elm Street	Mr. V. Dumais
68	3383 Elm Street	Mr. James Russell
69	3396 Elm Street	Mr. A. St. Denis
70	3387 Elm Street	Mr. R. Blanchette
71	3370 Maple Street	Mr. James Curtis
72	3363 Maple Street	Mr. Langes Laverdiere
73	3362 Maple Street	Mr. A. Bureau
74	3355 Maple Street	Mr. C. Grenier
75	3354 Maple Street	Mr. Robert Desjardina
76	3343 Maple Street	Mr. Ronald Teeter
77	3342 Maple Street	Mr. Gille Lacasse
78	3333 Maple Street	Mr. Mark Edwardson
79	3332 Maple Street	Mr. V. Doucet
80	3321 Maple Street	Mr. V. Rythlewski
81	3320 Maple Street	Mr. George Roberts
83	3296 Maple Street	Mr. Ivan Rewang
84	3297 Maple Street	Mr. Ken Salo
85	3290 Maple Street	Mr. Richar Gauvin
86	3285 Maple Street	Mr. S. Jobin
87	3277 Maple Street	Mr. John Gore
88	3262 Maple Street	Mr. J. McGraw
89	3252 Maple Street	Mr. L. Sonier

APPENDIX C (continued)

Survey Reference No.	Address	Occupant/Owner
91	3232 Maple Street	Mr. F. Rell
92	3229 Maple Street	Mr. Maurice Dakin
93	3222 Maple Street	Mr. Don Primeau
94	3109 Maple Street	Mr. V. Galipeau
95	3197 Maple Street	Mr. J. Savage
96	3198 Maple Street	Mr. G. Barrett
97	3185 Maple Street	Mr. Jerry Jacklin
99	3175 Maple Street	Mr. Norman Simoneau
100	3174 Maple Street	Mr. Paul VanDelight
101	3163 Maple Street	Mr. S. Ferguson
102	3164 Maple Street	Mr. J. G. Rocheleau
103	3141 Maple Street	Mr. Joseph Defforge
104	3152 Maple Street	Mr. O. Nylund
105	3143 Maple Street	Mr. R. Albert
106	3144 Maple Street	Mr. John Blouin
107	797 Durham Avenue	Mr. S. McCrae
108	805 Durham Avenue	Mr. D. Gallagher
109	827 Durham Avenue	Mr. William Riess
110	818 Main Street	Mr. E. Parve
111	812 Main Street	Mr. J. Upfold
112	800 Main Street	Mr. Peter Rawlyk
113	960 Main Street	Mr. L. Desrosiers

APPENDIX D

Sewage System Information

Type	No.	%
Septic Tank & Tile Bed	99	99
Leaching Pit	5	5
Age in Years		
<1	1	1
1 - 5	12	12
6 - 10	45	45
11 - 15	19	19
>15	17	17
Unknown	5	5

APPENDIX E

Water Supply Information

Type	No.	%	Average Depth (ft)	Bacteria Problems		Chemical Paramater Problems	
				No.	%	No.	%
Drilled	7	7	90	1	20	7	9
Sand Point	93	91	20.5	5	80	75	89
Dug	1	1	7	-	-	1	1
Unknown	1	1	N.A.	-	-	1	1
Total	102	100		6	100	84	100

AGE OF WELLS

Age (in years)	No.	%
<1	6	6
1 - 5	35	34
6 - 10	31	31
11 - 15	16	16
>15	5	5
Unknown	8	8

APPENDIX F

Consumer Well Complaints

		No.	%
Taste		29	29
Odour		23	23
Colour		14	14
Hardness		56	56
Iron		50	50
Quantity		17	17
Quality -	Excellent	10	10
	Very Good	5	5
	Good	36	36
	Fair	20	20
	Poor	17	17
	No Comment	11	11

WATER TREATMENT UTILIZED

	No.	%
Filter	9	9
Softener	2	2
Boil	3	3
Total	14	

APPENDIX G

Sunnyside Survey Summary Chemical Quality

Parameter	No. of Samples	Number Above Limit		Range	Median	Mean
		No.	%			
Sodium	99	42	42	1 - 146	16	20
Hardness	99	*	*	2 - 675	85	123
0-75	46					
75-150	33					
150-300	9					
300+	11					
Alkalinity	99	*	*	2 - 349	35	65
Iron	99	45	45	.01 - 6.0	.23	.65
Chlorides	96	2	2	1 - 334	20	36
Manganese	99	50	50	.001 - 1.5	.05	.13
Colour (Hazen Units)	98	65	65	1.0 - 235	7.3	18
Turbidity (Formazin Units)	98	70	70	.15 - 19	1.3	2.5
pH	99	48	48	5.1 - 8.6	6.5	6.8
Conductivity (umhos/cm)	99	*	*	60 - 1550	261	351
Organic Nitrogen	99	27	27	0.0 - .70	0.1	0.13
Nitrates	99	7	7	.05 - 41.0	1.6	3.8
Potassium	19	*	*	.20 - 12.0	2.3	3.3

Appendix G (continuted)

Parameter	No. of Samples	No. Above Limit No.	 %	Range	Median	Mean
Calcium	19	*	*	1.0 - 230	24	51
Magnesium	19	*	*	1.0 - 24	3.0	6.9
Sulphate	20	0	0	18 - 94	41	45
Fluoride	19	0	0	.05 - .20	.05	.07
Arsenic	17	0	0	<.001 - .001	<.001	<.001
Copper	9	0	0	.01 - .41	.04	.09
Lead	9	0	0	All Results<.03	<.03	<.03
Cadmium	9	0	0	All Results<.005	<.005	<.005
Zinc	99	0	0	.01 - 1.5	.2	.29

* No Limit

All parameters in mg/L unless otherwise indicated

APPENDIX H

M.O.E. STANDARDS FOR CHEMICAL PARAMETERS

Iron	0.3 mg/L
Chloride	250 mg/L
Colour	5 Hazen Units
Turbidity	1 Formazin Unit
pH	6.5 - 8.5
*Sodium	20 mg/L
Manganese	0.05 mg/L
T.O.C.	5 mg/L
Organic Nitrogen	0.15 mg/L
Nitrate	10 mg/L
Sulphate	250 mg/L
Fluoride	1.2 mg/L
Arsenic	0.01 mg/L Desirable Limit 0.05 mg/L Rejection Limit
Copper	1.0 mg/L
Lead	0.05 mg/L
Cadmium	0.01 mg/L
Zinc	5.0 mg/L

* Interim guidelines

GLOSSARY

A. BACTERIOLOGICAL EXAMINATIONS

1. Coliform Bacteria

The direct search for a specific pathogen in water is too uneconomical and slow for routine control purposes. Instead water is examined for an indication of fecal contamination by using specific groups of bacteria as indicators. When these groups are found in the water it is assumed that the water is potentially harmful. The standard group of micro-organisms used as an indicator is the coliform group which includes all aerobic and facultative anaerobic, Gram-negative, nonspore forming, rod-shoped bacteria that ferment lactose with gas formation within 48 hours at 35C. Organisms of the Escherchia coli strains which are usually of fecal origin, and of the intermediate and Aerobacter aerogenes strains which are usually but not always of soil, vegetable, or other non-fecal origin are included in this group.

1 (a) Total Coliforms

This group comprises species that are commonly associated with fecal matter (human and animal) and normal inhabitants of soil and vegetation. The presence of total coliforms in water may indicate contamination from soil runoff, or, less recent fecal pollution.

1 (b) Fecal Coliforms

These bacteria are mainly species associated with human and animal fecal matter. The presence of fecal coliforms in water indicates a relatively recent and near pollution input.

B. CHEMICAL ANALYSES

1. Alkalinity

Alkalinity is the measure of the power of a solution to neutralize hydrogen ions. It is used to define the buffering capacity (the capacity to resist changes in pH) of water. Alkalinity is expressed in terms of an equivalent amount of calcium carbonate. This does not necessarily imply that there is this much calcium carbonate in the water or that there is any at all. The alkalinity measurement represents the quantity of acid, expressed as calcium carbonate, needed to reduce the pH of a measured portion of sample to 4.5. It is caused by the presence of carbonates, bicarbonates, and hydroxides, and to a lesser extent by the presence of borates, silicates, phosphates, and organic substances. Alkalinity is not considered detrimental to human health but it is generally associated with high pH values, hardness and excessive dissolved solids.

2. Colour - Apparent

Apparent colour includes colour due to dissolved solids and suspended matter. Surface water color is due mostly to the presence of humic acids derived from decomposition of plant material. In groundwaters colour is usually due to the presence of iron and manganese. Most naturally coloured water (usually yellowish-brown) is harmless. The objective for domestic water supplies in Ontario is 5 Hazen Units.

3. Chloride

Chloride concentrations in water supplies may result from contact with natural minerals, industrial and agricultural wastes, or human and animal sewage. Urban runoff often contains high concentrations of chloride in the winter due to the application of road salt. Chlorides are generally not harmful. Allowable concentrations in drinking water are based on palatibility requirements rather than on health considerations. The water quality objective for domestic drinking water supplies in Ontario is 250 mg/L.

4. Conductivity

Conductivity is defined as the reciprocal of a water's electrical resistence (in ohms) between two electrodes one square centimeter in area and one centimeter apart at a standard temperature at 25C. It is a measure of the ion concentration in water. In natural waters conductivity is mainly due to calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulfate, and nitrate ions. Conductivity can be correlated with dissolved solids content. In Ontario the dissolved solids content is equal to 0.65 ± 0.10 times the conductivity. The permitted level for conductivity in drinking water in Ontario is indirectly established by the limit for dissolved solids.

5. Hardness

Hardness, defined as the soap neutralizing power of water, can be expressed in terms of an equivalent concentration of calcium carbonate. Hardness is mainly attributable to the presence of calcium and magnesium ions resulting from the natural accumulation of salts during contact with soil and geological formations. Hardness is objectionable because it reduces the efficiency of soap and it can produce scums and scales. Hardness in drinking water is limited indirectly by the criteria for dissolved solids (maximum of 500 mg/L). Concentrations over 120 mg/L become increasingly inconvenient.

6. Iron

Iron is the most abundant of the heavy metals in nature but despite this abundance it is generally found in relatively low concentrations in natural surface waters. In groundwater, however, conditions may be such that high concentrations of iron remain in solution. Iron concentrations occur in water due to the leaching of soluble iron salts from soil and rocks. Iron is non-toxic even at high concentrations but becomes objectionable in water because of the taste and odour it imparts. It also tends to precipitate as hydroxides staining laundry and porcelain fixtures. Also, ferric iron combines with the tannin in tea to produce a dark violet colour. The water quality objective for drinking water in Ontario (0.3 mg/L) is based on aesthetic and taste considerations.

7. Manganese

Manganese is a common element in nature and found in numerous minerals which include pyrolusite, braunite, manganesespat. It is essential in trace quantities for the proper nutrition of both plants and animals. Although manganese is non-toxic at levels commonly encountered in water supplies, it can cause unpleasant tastes and stain laundry and plumbing fixtures. Iron and manganese are commonly found together.

8. Nitrate Nitrogen

Nitrates are the end products of the aerobic stabilization of organic nitrogen and as such they occur in polluted waters that have undergone self-purification. They can occur in groundwater as a result of leachings from cesspools or fertilized soil. Photosynthetic action is constantly utilizing nitrates and converting them to organic nitrogen in plant cells but in groundwater this action is not possible and high concentrations of nitrates can result. Nitrates are undesirable because their nutritive properties promote the growth of algae and other aquatic plants. Although nitrates are considered non-toxic to adults, high levels in domestic water supplies can lead to a condition known as infant methemoglobinemia in which the oxygen carrying capacity of the blood is inhibited. The maximum acceptable level of nitrates for domestic water supplies in Ontario is 10 mg/L if the water is to be used for infant feeding.

9. pH

The symbol pH is used to designate the logarithm (base 10) of the reciprocal of the hydrogen ion activity. In the case of natural waters the hydrogen ion activity closely approximates the hydrogen ion concentrations in moles per litre. Although the hydrogen ion is a potential pollutant in itself, pH is also intimately related to the concentrations of many other substances. The degree of dissociation of many substances is influenced by pH and since the undissociated compounds are frequently more toxic than the ionic forms pH may be a highly significant factor in determining limiting concentrations. Also the hydrogen ion concentrations is important because it affects the taste and corrosivity of water and the efficiency of chlorination.

10. Sodium

Sodium ranks sixth in the natural order of elemental abundance and is normally the principal ion in brackish or saline groundwater. It is important for all life forms and is generally considered non-toxic. Patients with high blood pressure however are usually warned to avoid the consumption of water containing high concentrations of sodium. Waters softened by the ion-exchange process employed in most domestic water softening equipment, generally contain high levels of sodium.

11. Sulphates

Sulphates occur naturally in water as a result of leachings from minerals. Sulphates may also occur as the final oxidized stage of sulphides, sulphites, and thiosulphates, as the oxidized state of organic matter in the sulphur cycle and as a result of industrial wastes. Water high in sulphates tends to form hard scales on plumbing and increase the corrosiveness of water towards concrete. Under anoxic conditions sulphates serves as an oxygen source for bacteria which convert it to hydrogen sulphide gas. The maximum sulphate concentrations permissible for domestic water supplies in Ontario is 250 mg/L. Although the limit is not based on taste or physiological considerations, concentrations over the limits may exert a cathartic effect on the gastro-intestinal tract.

12. Turbidity

Turbidity is a measure of the optical properties of a water sample. It is attributable to suspended and colloidal matter which diminishes the penetration of light. Turbidity is useful in assessing water clarity. In Ontario turbidity is measured in Formazin Units.

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